

Gerald A. Tuskan

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EDUCATION

Ph.D. - 1984 - Genetics, Texas A&M University
M.S. - 1980 - Forest Genetics, Mississippi State University
B.S. - 1978 - Forest Management, Northern Arizona University

PROFESSIONAL APPOINTMENT

10% Lead Laboratory Science Program, Joint Genome Institute, 2006-present

Current Responsibilities: Coordinate the solicitation and review of PI-lead sequencing proposals submitted through the DOE laboratory system; establish multiple large-genome sequencing projects (representing 15% of JGI's sequencing capacity) that address DOE missions in the area of biofuels development, carbon sequestration, and global climate change; facilitate DOE, laboratory and JGI interactions.

90% Distinguished Scientist; Environmental Sciences Division; Oak Ridge National Laboratory; 2005-present

Current Responsibilities: Coordinate the BioEnergy Science Center effort to reduce recalcitrance in *Populus*, including coordinating all internal and external collaborations related to Association Studies, Activation Tagging, Expression Experiments, and QTL Analyses.

PRIOR EXPERIENCE

Research Professor; Departments of Plant Sciences; University of Tennessee; 2002-2007
Research and Senior Scientist; Environmental Sciences Division; Oak Ridge National Laboratory; 1990-2005
Associate Professor of Horticulture and Forestry; North Dakota State University; 1984-90
Instructor; Forest Science Department; Texas A&M University; 1981-84
Graduate Research Assistant; Forestry Department; Mississippi State University; 1979-80
Research Technician; Forestry Department; Northern Arizona University; 1978-79

GRANTS

U.S. DOE OBER. Title: BioEnergy Science Center. 2008-2012. \$125,000,000. P.I. M. Keller, Co-P.I. G.A. Tuskan.
U.S. DOE OBER. Title: A Functional Genomics Approach to Altering Crown Architecture in *Populus*: Maximizing Carbon Capture in Trees Grown in Dense Plantings. 2007-10. \$1,595,000. P.I. G.A. Tuskan.
U.S. DOE OBER. Title: Genome-Enabled Discovery of Carbon Sequestration Genes in Poplar. 2006-08. \$4,084,480. P.I. G.A. Tuskan.
Laboratory Director's Research and Development Grant. Title: Genome-Enabled Detection of Differential Mortality in a Northern Temperate Forest Ecosystem. 2005-06. \$263,000. P.I. G.A. Tuskan.
NSF Plant Genome. The *Populus* genome: Curation and chromosomal-level assembly. 2005-06. \$1,367,000. P.I. G.A. Tuskan.
U.S. DOE OBER. Title: Genome-Enabled Discovery of Carbon Sequestration Genes in Poplar. 2002-05. \$5,137,480. P.I. G.A. Tuskan.

Tuskan VITA

- U.S. DOE OBER. Title: Formation of an International *Populus* Genome Consortium and Creation of a *Populus* Post-sequence Science Plan. 2002-03. \$299,000. P.I. G.A. Tuskan.
- U.S. DOE Agenda 2020. Title: Environmental Influences on Wood Chemistry and Density of *Populus* and Loblolly Pine. 2001-05. \$990,000. P.I. G.A. Tuskan.
- U.S. DOE Biomass Power Program. Accelerated Domestication of *Populus*. 2001-02. \$540,000. P.I. G.A. Tuskan.
- Laboratory Director's Research and Development Grant. Title: Carbon allocation and partitioning in woody plants: A means to enhance bioenergy conversion and carbon sequestration. 2000-02. \$793,000. P.I. G.A. Tuskan.
- U.S. DOE Biofuels Feedstock Development Program CRADA. Title: Overcoming constraints to high-yield plantation-grown hardwoods in the southeastern United States. 1996-00. \$1,316,000. P.I. G.A. Tuskan.
- Laboratory Director's Research and Development Grant. Title: The isolation of DNA sequences that determine gender in Salicaceae. 1997-98. \$565,000. P.I. G.A. Tuskan.
- U.S. DOE Agenda 2020. Title: Genetic control of wood properties in loblolly pine and hybrid poplar. 1996-99. \$700,000. P.I. G.A. Tuskan.
- USDA Competitive Grant. Title: Mechanisms of persistence and extirpation of aspen seedlings following the 1988 Yellowstone fires. 1995-97. \$265,000. P.I. M.T. Turner *et al.*
- U.S. DOE Program for Ecosystem Research. Title: UV-B effects on forest tree pollen germination and genetic integrity. 1995-96. \$140,000. P.I. G.A. Tuskan
- U.S. DOE Program for Ecosystem Research. Title: Temperature Adjustment in Sugar Maple: Implications for Forest Succession in a Warmer Climate. 1993-95. \$585,000. P.I. R.J. Norby *et al.*
- Laboratory Director's Research and Development Grant. Title: Advanced Concepts for Production and Conversion of Renewable Plant Materials. 1993-95. \$600,000. Co-P.I. G.A. Tuskan and T.J. Tschaplinski.
- U.S. DOE Biofuels Feedstock Development Program CRADA. Title: Biochemical Basis of Drought Tolerance in Hybrid Poplars Grown Under Field Conditions. 1994-96. \$600,000. Co-P.I. T.J. Tschaplinski and G.A. Tuskan
- U.S. DOE Biofuels Feedstock Development Program Grant. Title: Biochemical and Molecular Basis of Water Stress Tolerance in *Populus*. 1991-93. \$325,000. Co-P.I. T.J. Tschaplinski and G.A. Tuskan.
- NSF Instrumentation and Laboratory Improvement Grant. Title: Enhancement of Undergraduate Biotechnology Cell Culture Laboratories. 1989-90. \$85,722. P.I. G.A. Tuskan.
- USDA Soil Conservation Service Grant. Title: Evaluation of cultural practices for shelterbelts in the northern Great Plains. 1989-90. \$61,960. P.I. G.A. Tuskan.
- USDA Competitive Grant. Title: Complementary *In vitro* selection of western gall rust resistant ponderosa pine. 1987-89. \$182,700. P.I. G.A. Tuskan.

PUBLICATIONS

- Yang, X., U.C. Kalluri, S.P. DiFazio, S.D. Wullschleger, T.J. Tschaplinski, Z.-M. Cheng and G.A. Tuskan. 2009. Poplar Genomics: State of the Science. *Critical Reviews in Plant Sciences* In press.
- Cheng, Z.-M. and G.A. Tuskan. 2009. *Populus* Community Mega-Genomics: Coming of Age. *Critical Reviews in Plant Sciences* In press.
- Tsai C-J, Ranjan P, DiFazio SP, Tuskan GA and Johnson V. 2009. Poplar Genome Microarrays. In: Joshi CP and DiFazio SP (eds), *Genetics, Genomics and Breeding of Crop Plants: Poplar*. Science Publishers, Enfield, New Hampshire In press.
- DiFazio, S.P., X. Yang and G.A. Tuskan. 2009. The *Populus* Genome. In: Joshi CP and DiFazio SP (eds), *Genetics, Genomics and Breeding of Crop Plants: Poplar*. Science Publishers, Enfield, New Hampshire In press.

The International *Brachypodium* Initiative. 2009. Genome sequence analysis of the model grass *Brachypodium*

distachyon: Insights into grass genome evolution. Nature In review.

- Basu, M.M., C.A Gunderson, P. Ranjan, G.A. Tuskan, T.J. Tschaplinski and U.C. Kalluri. 2009. Cellular- and macro-level *Populus* root growth characterization. Plant Cell Reports In review.
- Ranjan, P. T.-M. Yin, X. Zhang, U.C. Kalluri, X. Yang, S.S. Jawdy and G.A. Tuskan 2009. Bioinformatics-based identification of candidate genes from QTLs associated with cell wall traits in *Populus*. Bioenergy Research In review.
- Studer, M.H., J.D. DeMartini, M.F. Davis, R.W. Sykes, B.H. Davison, M. Keller, G.A. Tuskan, G. Slavov, C.E. Wyman. 2009. Lignin in natural *Populus* variants affects sugar release. PNAS In review.
- Yin, T.-M., M. Davis, L. Gunter, X. Zhang, R. Priya, R. Sykes, and G.A. Tuskan. 2009. Differential expression of genetic loci underlying above- and below-ground lignin contents in *Populus*. PLOS Genetics In review.
- Heinze, B., S. DiFazio, M. Land, F. Larimer, M. Nolan, K. Ritland, D. Rokhsar and G. Tuskan. 2009. Deep shotgun sequencing of the chloroplast genome of *Populus*. DNA Research In prep.
- Yang, X., G.A. Tuskan, T.J. Tschaplinski, Z.M. Cheng. 2009. The phylogeny based on third codon transversion resolves the conflict between evolution and development on the origin of flowering plants. Molecular Biol Genomic In review.
- Davis, M., R. Sykes, R. Dinus, G.A. Tuskan and C.-J. Tsai. 2009. A rapid method for measuring syringyl-to-guaiacyl lignin ratios in *Populus* using pyrolysis molecular beam mass spectrometry. Tree Genetic and Genomics In review.
- Yang XH, Jawdy S, Tschaplinski TJ, and Tuskan GA. 2009. Genome-wide identification of lineage-specific genes in *Arabidopsis*, *Oryza* and *Populus*. Genomics 93(5):473-480.
- Islam-Faridi MN, Nelson CD, DiFazio SP, Gunter LE, Tuskan GA. 2009. Cytogenetic Analysis of *Populus trichocarpa* - Ribosomal DNA, telomere repeat sequence, and marker-selected BACs. Cytogenetic and Genome Research 125(1):74-80.
- Drost DR, Novaes E, Boaventura-Novaes C, Benedict CI, Brown RS, Yin TM, Tuskan GA, Kirst M. 2009. A microarray-based genotyping and genetic mapping approach for highly heterozygous outcrossing species enables localization of a large fraction of the unassembled *Populus trichocarpa* genome sequence. Plant J 58(6):1054-1067.
- Yin, T.M., X.Y. Zhang, L.E. Gunter, S.X. Li, S.D. Wullschleger, M.R. Huang, G.A. Tuskan. 2009. SSR primer resource for *Populus* developed from the mapped sequence scaffolds of the Nisqually-1 genome. New Phytologist 181(2): 498-503.
- Yang, X., U.C. Kalluri, S. Jawdy, L.E. Gunter, T.M. Yin, T.J. Tschaplinski, D. Weston, P. Ranjan and G.A. Tuskan. 2008. Comparative analysis of F-box proteins in *Arabidopsis*, *Populus* and rice suggests differential proteolytic roles in woody perennial and herbaceous annual plants. Plant Phys. 148(3):1189-1200.
- Labbé, J., X. Zhang, T. Yin, J. Schmutz, J. Grimwood, F. Martin, G.A. Tuskan and F. Le Tacon. 2008. A genetic linkage map for the ectomycorrhizal fungus *Laccaria bicolor* and its alignment to the whole-genome sequence assemblies. New Phytologist 180:316-328.

- Quesada, T., Z. Li, C. Dervinis, Y. Li, P.N. Bock, G.A. Tuskan, G. Casella, J.M. Davis, and M. Kirst. 2008. Comparative analysis of the transcriptome of the *Populus trichocarpa* and *Arabidopsis thaliana* suggests extensive evolution of gene expression regulation in angiosperms. *New Phytologist* 180: 408-420.
- Yin, T.-M., S.P. DiFazio, L.E. Gunter, X. Zhang, M.M. Sewell, S. Woolbright, G.J. Allan, C.T. Kelleher, C.J. Douglas, G.A. Tuskan. 2008. Genome structure and emerging evidence of an incipient sex chromosome in *Populus*. *Genome Res* 18:422-430.
- Sykes, R., Kodrzycki, R., Tuskan, G., Foutz, K., and Davis, M. 2008. Within tree variability of lignin content in *Populus*. *Wood Science and Technology* 42(8): 649-661.
- Ralph, S.G., H.J.E. Chun, D. Cooper, R. Kirkpatrick, N. Kolosova, L. Gunter, G.A. Tuskan, C.J. Douglas, R.A. Holt, S.J.M. Jones, M.A. Marra, J. Bohlmann. 2008. Sequencing and analysis of 4,664 poplar full-length cDNA clones and their utility for the discovery of genes responding to insect feeding. *BMC Genomics* 9:57 doi:10.1186/1471-2164-9-57.
- Martin, F., A Aerts, D Ahren, F Duchaussoy, A Kohler, E Lindquist, A Salamov, HJ Shapiro, J Wuyts, D Blaudez, A Brun, M Buée, P Brokstein, B Canbäck, M Chalot, D Cohen, PE Courty, PM Coutinho, EGJ Danchin, C Delaruelle, JC Detter, A Deveau, S DiFazio, S Duplessis, L Fraissinet-Tachet, E Lucic, P Frey-Klett, C Fourrey, I Feussner, G Gay, J Gibon, J Grimwood, P Hoegger, P Jain, S Kilaru, J Labbé, YC Lin, F Le Tacon, R Marmeisse, D Melayah, B Montanini, M Muratet, U Nehls, H Niculita, MP Oudot-Le Secq, V Pereda, M Peter, H Quesneville, B Rajashekar, M Reich, S Rombauts, N Rouhier, J Schmutz, JP Jacquot, I Sanders B Henrissat, Y van de Peer, G Tuskan, U Kües, A Polle, A Tunlid, G Podila, P Rouzé, PM Richardson & IV Grigoriev . 2008. Symbiosis insights from the genome of the mycorrhizal basidiomycete *Laccaria bicolor*. *Nature* 452:88-93.
- Islam-Faridi N., Gunter L., DiFazio S., Tuskan G. and Nelson C. 2007. Cytogenetic localization of ribosomal DNAs in poplar using linkage group specific BACs. *Chromosome Research* 15:17-18.
- Filichkin, S.A., DiFazio, S.P., Brunner, A.M., Davis, J.M., Yang, Z.K., Kalluri, U.C., Arias, R.S., Etherington, E., Tuskan, G.A. and Strauss, S.H. 2007. Efficiency of gene silencing repeats vs. transitive RNAi in *Arabidopsis*: direct inverted vectors. *Plant Biotechnology J* 5(5):615-626.
- Kalluri, U.C., S.P. DiFazio, A. Groover, A. Brunner, M. Kirst, I. Dubchak and G.A. Tuskan. 2007. Genome-wide analysis of Aux/IAA and ARF gene families in *Populus trichocarpa*. *BMC Plant Biology* 7:59-73.
- Lin, J. L.E. Gunter, S. Harding, R.F. Kopp, R.P. McCord, C.-J. Tsai, G.A. Tuskan and L.B. Smart. 2007. Development of AFLP and RAPD markers linked to a locus associated with twisted growth in corkscrew willow (*Salix matsudana* 'Tortuosa') *Tree Physiology* 27:1575–1583.
- Kelleher CT, Chiu R, Shin H, Bosdet IE, Krzywinski MI, Fjell CD, Wilkin J, Yin TM, DiFazio SP, Ali J, Asano JK, Chan S, Cloutier A, Girm N, Leach S, Lee D, Mathewson CA, Olson T, O'Connor K, Prabhu AL, Smailus DE, Stott JM, Tsai M, Wye NH, Yang GS, Zhuang J, Holt RA, Putnam NH, Vrebalov J, Giovannoni JJ, Grimwood J, Schmutz J, Rokhsar D, Jones SJM, Marra MA, Tuskan GA, Bohlmann J, Ellis BE, Ritland K, Douglas CJ, Schein JE. 2007. A physical map of the highly heterozygous *Populus* genome: integration with the genome sequence and genetic map and analysis of haplotype variation. *Plant J* 50(6):1063-1078.
- Yang, X.H., G.A. Tuskan and Z.M. Cheng. 2006. Divergence of the *Dof* gene families in Poplar, *Arabidopsis* and rice suggests multiple modes of gene evolution after genome duplication. *Plant Physiol.* 142:820-830.

- Davis, M., G.A. Tuskan, M.M. Payne and R. Meilan. 2006. Assessment of *Populus* wood chemistry following the introduction of a Bt toxin gene. *Tree Physiology* 26:557–564.
- Tschaplinski, T.J., G.A. Tuskan, M.M. Sewell, G.M. Gebre, D.E. Todd and C.D. Pendley. 2006. Phenotypic variation and QTL identification for osmotic potential in an interspecific hybrid inbred F₂ poplar pedigree growing under contrasting environments. *Tree Physiology* 26:595–604.
- Davison BH, Drescher SR, Tuskan GA, Davis MF, Nghiem NP. 2006. Variation of S/G ratio and lignin content in a *Populus* family influences the release of xylose by dilute acid hydrolysis *Applied Biochemistry and Biotechnology* 130(1-3):427-435.
- Wheeler, N., P. Payne, V. Hipkins, R. Saich, S. Kenny and G. Tuskan. 2006. Polymix breeding with paternity analysis in *Populus*: A test for differential reproductive success (DRS) among pollen donors. *Tree Genetics and Genomes* 2:53-60.
- Tuskan, G.A., S.P. DiFazio, U. Hellsten, S. Jansson, S. Rombauts, N. Putnam, L. Sterck, J. Bohlmann, J. Schein, R.R. Bhalerao, R.P. Bhalerao, D. Blaudez, W. Boerjan, A. Brun, A. Brunner, V. Busov, M. Campbell, J. Carlson, M. Chalot, J. Chapman, G. Chen, D. Cooper, P.M. Coutinho, J. Couturier, S.F. Covert, R. Cunningham, J. Davis, S. Degroeve, C. dePamphilis, J. Detter, B. Dirks, I. Dubchak, S. Duplessis, J. Ehlting, B. Ellis, K. Gendler, D. Goodstein, M. Gribskov, I. Grigoriev, A. Groover, L. Gunter, B. Hamberger, B. Heinze, Y. Helariutta, B. Henrissat, D. Holligan, N. Islam-Faridi, M. Jones-Rhoades, R. Jorgensen, C. Joshi, J. Kangasjärvi, J. Karlsson, C. Kelleher, R. Kirkpatrick, M. Kirst, A. Kohler, U. Kalluri, F. Larimer, J. Leebens-Mack, J.C. Leplé, A. Déjardin, G. Pilate, P. Locascio, S. Lucas, F. Martin, B. Montanini, C. Napoli, D.R. Nelson, C.D. Nelson, K.M. Nieminen, O. Nilsson, G. Peter, R. Philippe, A. Poliakov, S. Ralph, P. Richardson, C. Rinaldi, K. Ritland, P. Rouzé, D. Ryaboy, A. Salamov, J. Schrader, B. Segerman, F. Sterky, C. Souza, C. Tsai, P. Unneberg, K. Wall, S. Wessler, G. Yang, T. Yin, C. Douglas, G. Sandberg, Y. Van de Peer & D. Rokhsar. 2006. The genome of black cottonwood, *Populus trichocarpa* *Science* 313 (5793):1596-1604.
- Wullschleger, S.D., T.M. Yin, S.P. DiFazio, T.J. Tschaplinski, M.F. Davis, L.E. Gunter, and G.A. Tuskan. 2005. Phenotypic variation in absolute and proportional biomass allocation for two advanced-generation pedigrees of hybrid poplar (*Populus* spp.). *Can. J. For. Res.* 35:1779-1789.
- Romme, W.H., M.G. Turner, G.A. Tuskan and R.A. Reed. 2004. Establishment, persistence, and growth of aspen (*Populus tremuloides*) seedlings in Yellowstone National Park. *Ecology* 86:404-418.
- Yin, T.-M., S.P. DiFazio, L.E. Gunter, S.S. Jawdy and G.A. Tuskan. 2004. Mapping the rust resistant loci *MXC3* and *MER* in *P. trichocarpa* and assessing the intermarker linkage disequilibrium in the *MXC3* region. *New Phytologist* 164:95-106.
- Lammers, P., G.A. Tuskan, S.P. DiFazio, G.K. Podila and F. Martin. 2004. Mycorrhizal symbionts of *Populus* to be sequenced by the United States Department of Energy's Joint Genome Institute. *Mycorrhiza* 14(1):63-64.
- Tuskan, G.A., L.E. Gunter, Z.K. Yang, T.M. Yin, M.M. Sewell and S.P. DiFazio. 2004. Characterization of microsatellites revealed by genomic sequencing of *Populus trichocarpa*. *Can. J. For. Res.* 34:85-93.
- Martin F, G.A. Tuskan, S.P. DiFazio, P. Lammers, G. Newcombe, and G.K. Podila. 2004. Symbiotic sequencing for the *Populus* mesocosm. *New Phytol.* 161(2):330-335.
- Yin, T.-M., S. P. DiFazio L.E. Gunter D. Riemenschneider and G.A. Tuskan. 2004. Large-scale heterospecific segregation distortion in *Populus* revealed by a dense genetic map. *Theor. Appl. Genet.* 109(3):451-463.

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- Slavov, G.T., G.T. Howe, I. Yakovlev, K.J. Edwards, K.V. Krutovskii, G.A. Tuskan, J.E. Carlson, S.H. Strauss and W.T. Adams. 2004. Highly variable SSR markers in Douglas-fir: Mendelian inheritance and map locations. *Theor. Appl. Genet.* 108:873-880.
- Coleman M.D., D.R. Coyle, J. Blake, K. Britton, M. Buford, B. Campbell, J. Cox, B. Cregg, D. Daniels, M. Jacobson, K. Johnsen, T. McDonald, K. McLeod, E. Nelson, D. Robison, R. Rummer, P. Sanchez, J. Stanturf, B. Stokes, C. Trettin, J. Tuskan, L. Wright, and S. Wullschleger. 2004. Production of short-rotation woody crops grown with a range of nutrient and water availability: Establishment report and first-year responses. U.S. For. Serv. Research Paper General Technical Report SRS-72. pp. 26.
- Tuskan G.A., S.D. Wullschleger, J.H. Cushman, R.L. Graham, S.R. Thomas. 2003. Mitigation of Greenhouse warming, biomass-based energy supply systems and accelerated domestication of energy crops. In: *Applications of Biotechnology to Mitigation of Greenhouse Warming*. Battelle Press. pg. 23-46.
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- Turner, M. G., W.H. Romme, R.A. Reed and G.A. Tuskan. 2003. Post-fire aspen seedling recruitment across the Yellowstone (USA) landscape. *Landscape Ecology* 18:127-140.
- Gunter, L.E., A.S. Black, S. Ratnayeke, G.A. Tuskan and S.D. Wullschleger. 2003. Assessment of genetic similarity among 'Alamo' switchgrass seed lots using RAPD markers. *Seed Sci. & Technol.* 31:681-689.
- Plomion, C., J. Cooke, T. Richardson, J. MacKay and G. Tuskan. 2003. Conference report on the forest trees workshop at the Plant and Animal Genome Conference. *Comp. Funct. Genom.* 4:229-238.
- Gunter, L.E., R.F. Kopp, R.P. McCord and G.A. Tuskan. 2003. Analysis of sex-linked SCAR markers in *Salix eriocephala* Michx. *Can. J. For. Res.* 33(9): 1785-1790.
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carnivore, the raccoon. *Mol. Ecol.* 11 (6): 1115-1124.

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- Kopp, R.F., L.B. Smart, C.A. Maynard, J.G. Isebrands, G.A. Tuskan and L.P. Abrahamson. 2001. The status of genetic improvement of *Salix* in North America. *Forestry Chronicles* 77:287-292.
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- Gunter, L.E., G.A. Tuskan, C.A. Gunderson and R.J. Norby. 2000. Genetic variation and spatial structure in sugar maple (*Acer saccharum* Marsh) and implications for predicted global-scale environmental change. *J. Global Climate Change Res.* 6(3):335-344.
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- Stevens, M.T., M.G. Tuner, G.A. Tuskan, W.H. Romme, L. Gunter and D.M. Waller. 1999. Genetic variation in post-fire aspen seedlings in Yellowstone National Park. *Mol. Ecol.* 8:1769-1780.
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